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Standard Recommended Practice for
OPERATING LIGHT- AND WEATHER-EXPOSURE APPARATUS (CARBON-ARC TYPE) FOR ARTIFICIAL WEATHER TESTING OF RUBBER COMPOUNDS[1]

This Standard is issued under the fixed designation D 750; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

NOTE—Editorial changes adding a new Footnote 3 were made in April 1968. Further revisions were made to the text in October 1969.

1. Scope

1.1 This recommended practice covers specific variations in the test conditions and procedures which shall be applicable when ASTM Recommended Practice G 23, for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials[2] is employed for exposures of vulcanized rubber compounds. It also covers the preparation of test specimens and the evaluation of test results. This method is not intended to cover the testing of materials ordinarily classed as hard or semi-hard rubber.

2. Nature of Test

2.1 This recommended practice describes a procedure to use in continuously or intermittently exposing rubber specimens held in a jig or holder under a specified strain. This exposure assesses the effect of light having essentially the same wavelengths as are found in natural sunlight but with increased intensity in the ultraviolet range. The primary criterion used in estimating resistance to light aging is the percentage decrease in tensile strength and in elongation at break. A supplementary criterion for estimating resistance to light aging is the observed extent of surface crazing and cracking.

3. Test Specimens

3.1 Unless otherwise mutually agreed upon, test specimens shall be rectangular strips 75 mm (3 in.) in width by 150 mm (6 in.) in length prepared especially for this recommended practice or cut from the material to be evaluated. The specimens should have a maximum thickness of 0.75 mm (0.030 in.) and a minimum thickness of 0.60 mm (0.025 in.). If evaluation is limited only to visual observation, then specimens of any thickness may be used and the thickness shall be included in the report. Specimens cut from rubber products may be buffed. Duplicate specimens should be exposed whenever possible.

4. Procedure[3]

4.1 Firmly fasten the test specimens in a jig or holder that permits exposure either with or without elongation. While exposures are usually made without elongation of the test specimen, when mutually agreed upon, any specified amount of elongation may be employed but this must be reported in the results of the test.

4.2 Proceed in accordance with 4.2, 4.3, and 4.4 of Recommended Practice G 23.

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[1] This recommended practice is under the jurisdiction of ASTM Committee D-11 on Rubber and Rubber-Like Materials and is the direct responsibility of Subcommittee D-11.15 on Degradation Tests.

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[2] *1974 Annual Book of ASTM Standards*, Part 41.

[3] Standardized light-sensitive plastic chips (SRM #702—0.124 in. thick and SRM #703—0.060 in. thick) may be obtained from the Office of Standard Reference Materials National Bureau of Standards, Washington, D.C. 20234.

NOTE—Although a black panel temperature of 63 ± 5 C (145 ± 9 F) is specified as standard, if that temperature is found unsuitable for the product being tested, other temperatures may be used, but this must be reported in the results of the test.

4.3 The water from the specimen spray shall strike the test specimens in the form of a fine spray equally distributed over the test specimens. Unless otherwise specified in the applicable ASTM method or detailed material specification, the water pressure, number, and type of nozzles shall be in accordance with the detailed requirements for the various types of apparatus as indicated in Figs. 1 to 5 of Recommended Practice G 23. The pH of the water shall be 6.0 to 8.0 and the water shall not leave an objectionable deposit or stain on the specimens after continued exposure in the apparatus. The temperature of the water shall be 16 ± 5 C (60.0 ± 9 F), and recirculation shall not be permitted unless the recirculated water meets the above requirements. For certain test materials or for water systems fabricated of certain materials (for example, aluminum), the use of deionized or distilled water may be advisable. The chlorine content of the water shall be determined and reported.

4.4 Proceed in accordance with 4.6 to 4.9 of Recommended Practice G 23.

4.5 Test for the presence of ozone in the testing unit adjacent to the exposed specimen by exposing a small filter paper previously dipped in starch-potassium iodide solution. Ozone, if present, will cause the test paper to turn blue. The length of time required for the formation of a deep blue coloration may be taken as an indication of the quantity of ozone present. Shield the test paper from the light source. An alternative test for the presence of ozone may be made as follows: Select a 25 by 75-mm (1.0 by 3.0-in.) sample of the control stock of the material being exposed and stretch to an elongation of 25 percent. Place it in the artificial light and water exposure apparatus at the position of the irradiated specimens but shielded from the direct rays of the arc. If available, expose a 25 by 75 by 2.5-mm (1.0 by 3.0 by 0.1-in.) sample of natural rubber or SBR black tire tread stock similarly and simultaneously. Report the time of exposure necessary to form the first visible cracks to indicate the ozone concentration. Also report the number and type of cracks.

4.6 While not mandatory, when desired or mutually agreed upon, the light source may be periodically calibrated in accordance with ASTM Method D 749, Calibrating a Light Source Used for Accelerating the Deterioration of Rubber[4] or ASTM Recommended Practice D 1920, for Determining Light Dosage in Carbon-Arc Light Aging Apparatus.[5]

5. Periods of Exposure

5.1 Use one of the following methods to determine the duration of exposure under this recommended practice:

5.1.1 A mutually agreed upon specified number of hours.

5.1.2 The number of hours of exposure required to produce mutually agreed upon minimum acceptable changes in either the test specimen or an agreed upon standard sample, or

5.1.3 The number of hours of exposure required to produce a mutually agreed upon minimum amount of change in the exposed test specimen.

6. Evaluation of Results

6.1 At the conclusion of the exposure period, the specimen shall be removed from the testing unit and examined for degree and number of cracks and for evidence of crazing.

6.2 After the above visual examination of the test specimen, three tension test specimens shall be prepared from it in accordance with ASTM Methods D 15, Compound and Sample Preparation for Physical Testing of Rubber Products.[4] The tensile strength and ultimate elongation of these exposed specimens shall be determined in accordance with ASTM Method D 412, Tension Testing of Vulcanized Rubber.[4] The tensile strength and elongation of duplicate unexposed specimens of the same materials shall be determined for purposes of comparison at the same time that the exposed specimens are tested.

7. Report

7.1 The report shall include the following:

7.1.1 Number of hours of exposure,

7.1.2 Type of apparatus, cycle and operating conditions employed,

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[4] *1974 Annual Book of ASTM Standards*, Part 37.

[5] *1974 Annual Book of ASTM Standards*, Part 35.

7.1.3 Any variations from the specified conditions;

7.1.4 Description and dimensions of specimens,

7.1.5 Number of cracks and degree of crazing or cracking of the specimens,

7.1.6 Percentage of elongation during exposure, if any,

7.1.7 Tensile strength in kilopascals (pounds per square inch) before and after exposure,

7.1.8 Ultimate elongation at break before and after exposure,

7.1.9 Percentage loss in tensile strength as a result of exposure,

7.1.10 Percentage loss in elongation at break as a result of exposure,

7.1.11 Indication of ozone,

7.1.12 Chlorine content of the water,

7.1.13 When determined, the intensity of the light source expressed as the number of milligrams of anhydrous oxalic acid decomposed per square decimeter per minute, and

7.1.14 When determined, the total exposure expressed in equivalents of the number of milligrams of anhydrous oxalic acid decomposed at the rate determined by the average intensity of exposure multiplied by the total length of time of exposure.

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